

### ANALYSIS OF CATCH STATISTICS FROM THE DEEP-WATER PRAWN (*HALIPOROIDES SIBOGAE*) FISHERY OFF NEW SOUTH WALES, AUSTRALIA.

The deep-water trawl fishery for royal red prawns (*Haliporoides sibogae* De Man, 1907) has developed quite recently (mid 1970s) off New South Wales, Australia. Temporal and spatial trends in catch, fishing effort and catch-per-unit effort (CPUE) were analysed using landing statistics from fishermen's cooperatives (1978–1985) and data from a recently introduced logbook system (1985–1988). Fishing effort and CPUE were standardised using (i) a method derived from Gulland or (ii) log-linear regression techniques depending on the quality of data which differed between areas and periods of time. Regression techniques also allowed identification of factors influencing the variability of CPUE. Time of fishing (in terms of three month period) and engine power of vessel explained 79.4 and 20.6% of the variability of CPUE accounted for by the regression model, respectively.

Fishing effort was concentrated within small ranges of latitude (1°) and depth (100 m). Economic and logistic factors, rather than differences in prawn abundance, may be responsible for this geographic concentration of the fishery, suggesting that the royal red prawn stock is not exploited over

its full distribution. The absence of obvious temporal and spatial variations in CPUE indicated that royal red prawns caught off central and southern New South Wales belonged to the same stock which was available throughout the year. This apparent temporal and spatial stability of CPUE contrasted with the great variation in CPUE generally observed for coastal prawn species revealing an important difference in the population dynamics between coastal prawns species and deep-water royal red prawns.

From 1979, annual landings have been stable at about 300–350 tonnes and there is at present no apparent reason for concern for the state of the royal red prawn stock off New South Wales. However, the availability of catch and effort data in the present study was limited in space and time. To better understand the relationship between fishing patterns and trends in abundance of prawns it would be necessary to 1) extend the area covered by logbooks, which is limited presently to central and southern New South Wales, and 2) conduct stratified fishing surveys outside the main distribution of the fishery.

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### AN APPRAISAL OF TRAWLING AS A TOOL FOR STOCK ASSESSMENT AND DEVELOPMENT OF HARVESTING STRATEGIES IN SOUTH AUSTRALIAN *PENAEUS LATISULCATUS* FISHERIES.

South Australian prawn fisheries are based on a single penaeid species *Penaeus latisulcatus*. Over the last decade, prawn landings in Spencer Gulf have ranged from 1.4 to 2.3 thousand tonnes with a current export value of \$50 million. There has been a marked increase in larger prawn grades of the catch attributable to refinement of harvesting strategies. The Spencer Gulf fishery is limited entry (39 vessels) with controls on gear, vessel physical characteristics, amount and direction of effort. Large scale survey sampling is undertaken in conjunction with industry for stock assessment and for development of real time harvesting strategies.

The main objectives of the research are: to develop strategies which minimise the risk of recruitment over-fishing and to optimise the value of the catch. This paper is a brief appraisal of trawl sampling methodology and its application to management.

Trawl sampling is systematic over a wide scale and is primarily based on stratified sampling plans. Inherent problems associated with sampling are apparent. Sampling has a number of functions which in turn require different sampling plans. Owing to environmental gradients, sampling variance can be minimised by sampling across rather than along the gradient. However, cross sampling has practical restrictions:

furthermore, information is lost relating to spatial size structure which is necessary for closure delineation. Mixed sampling plans and the value of strategic 'spot' surveys provide a solution to the problem.

The information obtained from survey sampling is used in conjunction with fishermen's log book data for evaluation of the effects of fishing, parameter estimation and development of sequential harvesting strategies. The application of survey data to 'optimal' harvest simulation incorporates a harmonic growth model which enables predictions of biomass and value at different regions in the Gulf. Results show that natural mortality has a large influence on model predictions. Information indicates that biomass and biovalue trends differ depending upon the size composition of the population. However, over all regions, both biomass and biovalue decrease from June to February. Hence, effort reduction from June to March has two advantages: it reduces reproductive depletion attributable to fishing and results in increased value of catch.

The work demonstrates the importance of the participation and cooperation of fishermen in research and management.

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